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Chapter 2

A SURVEY OF RIPARIAN FOREST FLORA AND FAUNA IN CALIFORNIA

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California is a desert in the warm half of the year in cismontane California and all the year in transmontane. Even the mountains have precipitation of only desert dimensions in summer. The all-year desert occupies all the southern San Joaquin Valley (Major, 1977), and, even as far north as Williams, the Central Valley receives only 390 mm/yr of precipitation with need for water greater than the upland supply during eight months. Riparian habitats are the only mesic breaks in these very extensive desert tracts. Their extraordinary natural productivity is due to optimum conditions of sunlight, water, and nutrients. As one might expect from the presence of abundant, dense, rapidly transpiring vegetation, the microclimate in riparian forests is similar to that of a greenhouse. Humidity and temperatures are high, the air is still, and evapotranspiration can be rapid. Heller (1969) showed the quantitative dependence of this unique microclimate on the amount of water flowing in the river.

Riparian habitats are azonal. They are not only determined by the climatic zone in which they happen to occur, the kinds of rocks from which their soils have formed, or the available kinds of plants and animals, but also by features peculiar to them. For example, they have a high water table, and nutrients are supplied in abundance both in ionic form and as unweathered rock particles by annual flooding. Their soils are often relatively coarse textured, well drained, and well aerated, at least at the surface horizons. Also, these soils are young, without hardpans, and have periodically open niches as the result of flooding, bank erosion, and deposition of mixed gravels and silts. As well, these alluvial deposits are often naturally fertilized by organic debris from the forests. If clays occur, they are in thin lenses deposited in backwaters, and they usually hold up a water table only temporarily.

The high biological productivity of California riparian habitats can be seen in the following examples. The coast redwoods develop best on riparian floodplain sites producing the largest biomass figure known: 452,500 grams per square meter (Franklin & Dyrness 1973). The montane forests are most magnificent in the valleys. In the foothills, shade from streamside trees contrasts with sun-soaked chaparral slopes. The grandest hardwood forests in California undoubtedly once bordered the Sacramento River. The Fremont cottonwoods of the drier interior Coast Ranges are bright green ribbons in a darker, evergreen, or tawny landscape. In the Great Basin the same tree contrasts even more with sagebrush. In the hot deserts trees may still occur in riparian habitats amidst a landscape of low, widely-spaced, xerophytic shrubs. The Colorado River Delta in the most extreme desert area in North America must have once had an enormous productivity, judging by the description by Aldo Leopold (L. Leopold 1953). In the same desert area dry washes are marked by tall shrubs of very different species from those in the zonal desert landscape.

Ornduff has aptly summarized (1974:99): "Since the climatic regime over much of California is an arid one, the local occurrence of permanent standing or running water has a striking influence on the vegetation. The many large streams and rivers that flow out of the California mountains are generally lined with deciduous trees, shrubs, and herbs that are restricted to the banks of these water courses." These complex communities can also include vines and tall herbaceous undergrowth, and, in the milder and moister parts of California such as the North Coast, the riverine forests include evergreen as well as deciduous species. Some of California's most rare and endangered plant species are limited to the riparian habitat. An example is the beautiful wild hibiscus, Hibiscus californicus, an herbaceous perennial shrub with 15 - 20 cm diameter white and dark red flowers found only on the few undisturbed slough banks which remain in the Central Valley.

Much of what we understand about riparian woodlands and their ecology in California must be interpreted from work done on the ecology of riparian ecosystems in other parts of the world, because relatively few studies have been completed in California. We can, however, provide a general description of California's riparian forests and their plant and animal species based on literature searches and personal communications. Our survey was

limited to depositional (alluviating) streams below 4,000 ft (1,200 m) elevation with perennial surface water (Tables 1, 2, 3 and 4 prepared by Warren G. Roberts and J. Greg Howe). We did not include the very narrow riparian woodland bordering the scouring, or non-depositional, streams in the mountains nor the depositional stretches of streams above 1200 m such as Vidette Meadows on the Kings River, Tuolumne Meadows, and the upper Kern River meadows. The strictly herbaceous plants of riverine forests were also excluded.

Woody plants of the riparian woodlands of the Central Valley, North Coast, South Coast, Palm Oases, Deserts, and Northeastern Valleys are listed in Table 1 and illustrated in Figure 1. The first four types are typically Californian, while the remaining three are more closely related to forests of adjacent states and Mexico. It should be noted that some of the plants in the riparian forest originated from cooler, moister ecological zones which occasionally overlapped the riverine habitat. Examples of these are Quercus agrifolia in the Sacramento-San Joaquin Delta, and Pinus ponderosa along the Owens River. Adventive species (plants which have established in the riparian woodland as the result of human activities) include the following exotic genera: Ailanthus, Robinia, Tamarix, and Arundo.

Although knowledge of riparian woodland invertebrate and vertebrate fauna is limited, we included partial lists of mammals, reptiles, amphibians, and butterflies known to inhabit the remaining stands of this extraordinary habitat. An illustration of the urgent need for more extensive field work is Art Shapiro's discovery that a beetle, Desmocerus californicus ssp. dimorphos, is known only from the riparian forests of Sacramento, Yolo, and Merced Counties. It has been nominated for the United States Department of the Interior's "Threatened List." The beetle requires Sambucus caerulea and S. mexicana as host plants. The avifauna are excluded from this survey as they are treated in detail by David Gaines in Chapter Seven. Likewise, the fishes are discussed by Donald Alley in Chapter Eight. Virtually all of the butterflies known to breed in the Sacramento Valley have been seen in riparian forests. Those which are most associated with such forests are listed in Table 4.

The original riparian forests covered several million acres; today they are measured in the thousands (Figure 2). For example, the Sacramento River had 800,000 acres of riparian vegetation left in 1848 and 12,000 in 1972; five percent of the high terrace habitat has been lost in the last twenty years. The riparian woodland along the Colorado River has diminished rapidly in just the last five years. Thus, most of California's riparian ecosystems have been destroyed or degraded. Major man-caused changes have been conversion of forest to orchard and field crops, logging for wood chips, streambank stabilization, channelization, reduction of water flow by dams and irrigation, and accelerated erosion of river banks due to dams upstream and channelization in adjacent areas.

Further losses of habitat are attributable to gravel and gold mining, grazing, and water pollution. Urbanization brings its housing developments, freeways and landfills to the riverlands. Even recreational developments can have detrimental results: removal of understory vegetation, construction of docks and boat ramps, and introduction of exotic plant species all speed the degradation of the riparian ecosystem. In 1958, Wistendahl optimistically stated: "The increasing recognition of the value of natural areas as part of park systems makes it possible that certain parts of the flood plain system may ultimately be allowed to grow back to their original magnificence." We hope these remarks will be heeded before all the significant riparian species are gone.

Literature Cited

Abrams, L. & R. S. Ferris. 1923-60. Illustrated flora of the Pacific States. 4 vol. Stanford Univ. Press, Stanford.

Baker, M. S. 1951. A partial list of seed plants of the north coast counties of California. Santa Rosa Junior Coll, Santa Rosa.

Bakker, E. S. 1971. An island called California. Univ. Calif. Press, Berkeley.

Berry, Shad. personal communication.

Franklin, J. F. & C. T. Dyrness. 1973. Natural vegetation of Oregon and Washington. U. S. Forest Service, Pacific Northwest Forest & Range Exp. Sta. Gen. Techn. Report PNW-8, p. 54.

Griffin, J. R. & W. B. Critchfield. 1972. The distribution of forest trees in California. U. S. Forest Service, Pacific SW For. & Range Exp. Sta. Res. Paper PSW-82.

Heller, H. 1969. Lebensbedingungen und Abfolge der Flussauenvegetation in der Schweiz. Mitt. Schweiz. Anst. forstl. Versuchswesen 45(1):3-124.

Holmes, L. C., Nelson, J. W., and Party. 1915. Reconnaissance Soil Survey of the Sacramento Valley, California. U. S. Dept. of Agriculture Publ., (Government Printing Office) Washington D. C.

Hoover, R. F. 1970. The vascular plants of San Luis Obispo County, California. Univ. Calif. Press, Berkeley.

Howell, J. T. 1970. Marin flora, with supplement. Univ. Calif. Press, Berkeley.

Howitt, B. F. & J. T. Howell. 1964. The vascular plants of Monterey County, California. Wasmann J. Biol. 22(1):1-184. 1973, Supplement, Pacific Grove Mus. Natural History Assoc, Pacific Grove, California.

Ingles, L. G. 1965. Mammals of the Pacific States. Stanford Univ. Press, Stanford.

Jepson, W. L. 1893. The riparian botany of the lower Sacramento. Erythea 1:228-246.

Jepson, W. L. 1909-1943. A flora of California. Vols. 1-3. Assoc. Students Store, Univ. California, Berkeley.

Jue, Dean. Personal communication.

Leopold, L. B., ed. 1953. Round river. Oxford Univ. Press, N. Y., pp. 10-30.

Lowe, Charles H., Personal communication.

Major, J. 1977. California climate in relation to vegetation. In Terrestrial vegetation of California, ed. M. G. Barbour & J. Major. pp. 11-74. John Wiley, N. Y.

Major, J. 1963. Checklist of vascular plants in Yolo, Sacramento, Solano and Napa Counties, California. Dept. Botany, Univ. California, Davis.

Mason, H. L. 1957. A flora of the marshes of California. Univ. Calif. Press, Berkeley.

Munz, P. A. 1974. A flora of southern California. Univ. Calif. Press, Berkeley.

Munz, P. A. 1968. Supplement to a California flora. Univ. Calif. Press, Berkeley.

Munz, P. A. & D. D. Keck. 1959. A California flora. Univ. Calif. Press, Berkeley.

Nelson, J. W., J. E. Guerney, L. C. Holmes, and E. C. Eckman. 1918. Reconnaissance Soil Survey of the Lower San Joaquin Valley, California. U. S. Dept. of Agriculture Publ., Government Printing Office, Washington D. C.

O'Brien, R. J., L. K. Puckett, & T. B. Stone. 1976. Birds in riparian habitat of the upper Sacramento River. Memorandum Report, Calif. Dept. Fish & Game, Sacramento.

Ornduff, R. 1974. Introduction to California plant life. Univ. Calif. Press, Berkeley.

Parish, S. B. 1930. Vegetation of the Mohave and Colorado deserts of southern California. Ecology 11:481-503.

Peck, M. E. 1961. A manual of the higher plants of Oregon. Oregon State Univ. Press, Corvallis.

Rudd, Robert. Personal communication.

Sacramento County Office of Education. 1975. The outdoor world of the Sacramento region.

Shapiro, A. M. 1974. The butterfly fauna of the Sacramento Valley, California. J. Res. Lepidoptera 13:73.

Stebbins, R. C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston.

Stone, T. 1976. Observations on furbearers within the riparian habitat of the upper Sacramento River, California. Calif. Fish & Game Memorandum Report.

Sudworth, G. B. 1908. Forest trees of the Pacific slope. U. S. Forest Service Bull. Dover ed., 1967.

Taylor, Dean. Personal communication.

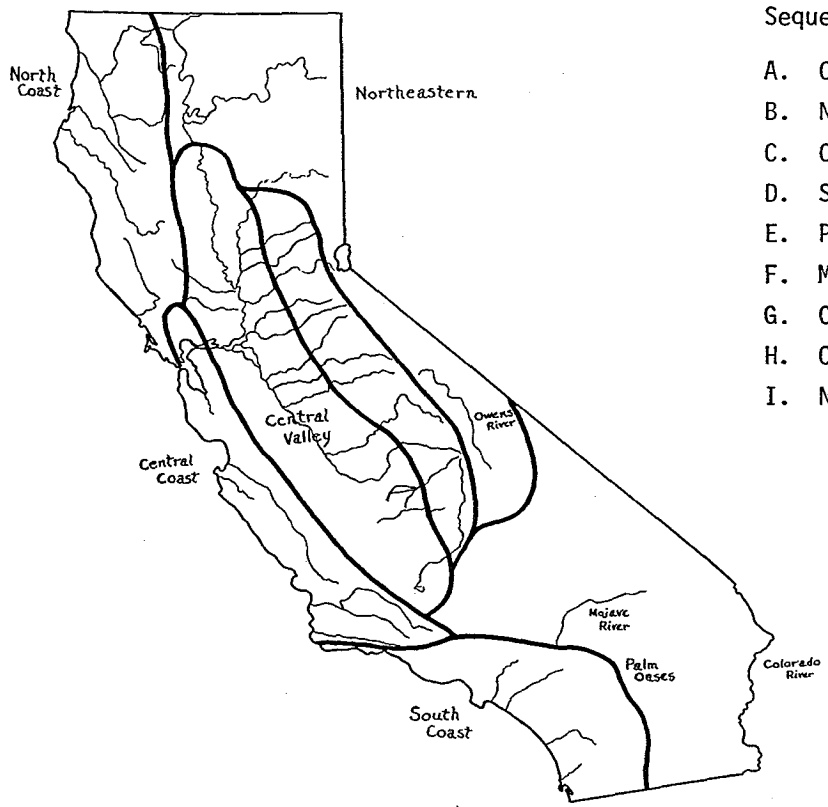
Trapp, Gene. Personal communication.

Twisselmann, E. C. 1967. A flora of Kern County, California. Wasmann J. Biology 25(1/2):1-395.

Vogl, R. T. & L. T. McHargue. 1966. Vegetation of California fan palm oases on the San Andreas Fault. Ecology 47:532.

Wistendahl, W. A. 1958. The flood plain of the Raritan River, New Jersey. Ecol. Monogr. 28:129-153.

Figure 1. Riparian Woodland Divisions of California.



Sequence as in Table 1.

A. Central Valley
B. North Coast
C. Central Coast
D. South Coast
E. Palm Oases
F. Mojave River
G. Colorado River
H. Owens Valley
I. Northeastern

Figure 2. The original (in gray) and existing (in black) Riparian Woodland of the Sacramento and San Joaquin River Drainages (depositional portions only) compiled by J. Greg Howe.

The original extent of riparian woodland was determined with the use of soil maps published before 1920 (Holmes, 1915 and Nelson, 1918). These maps, in particular the reconnaissance soil survey maps of the Sacramento Valley and the lower San Joaquin Valley, outline all soil types and describe their existing and pristine native vegetation. An example of this soil analysis is the Columbia series. The two Columbia soils, Columbia fine sandy loam and Columbia silt loams, are the principle soil groups lining the Sacramento and Feather Rivers and make up most of the gray region on the map.

A description of the native vegetation on the Columbia fine sandy loam describes it as "originally covered with a heavy forest growth consisting mainly of sycamore, cottonwood, willow and oak, with a thick undergrowth. A great deal of the surface has been cleared and cultivated, but much of the lowest. . . areas yet remain a thick jungle." (Holmes, 1915 p. 108 Ref. 1) And also, referring to the Columbia silt loams; "originally the soils of this group were heavily timbered. In the better drained locations, slightly removed from the stream channels, the valley oak predominated with a vigorous undergrowth. The lower-lying areas, or those most subject to overflow, supported a tangled growth approaching a tropical jungle in density, consisting mostly of cottonwood, sycamore, willow and wild grape." (Holmes, 1915, p. 111) The same descriptions occur in the Lower San Joaquin Valley soil survey; however, they are not as detailed and inviting as those of the Sacramento soil groups.

The present distribution of riparian woodland on the major rivers was developed from aerial photographs, most of which were taken after 1970. The San Joaquin and Sacramento river photographs were taken in 1975. All photographs (with scales ranging from 1:6,000 - 1:24,000): the California Department of Water Resources and the U.S. Army Corps of Engineers. Some of the smaller rivers, such as Stony and Honcut creek, were analyzed for woodland with the use of photo-revised (1969 or later) United States Geological Survey maps.

Figure 2.

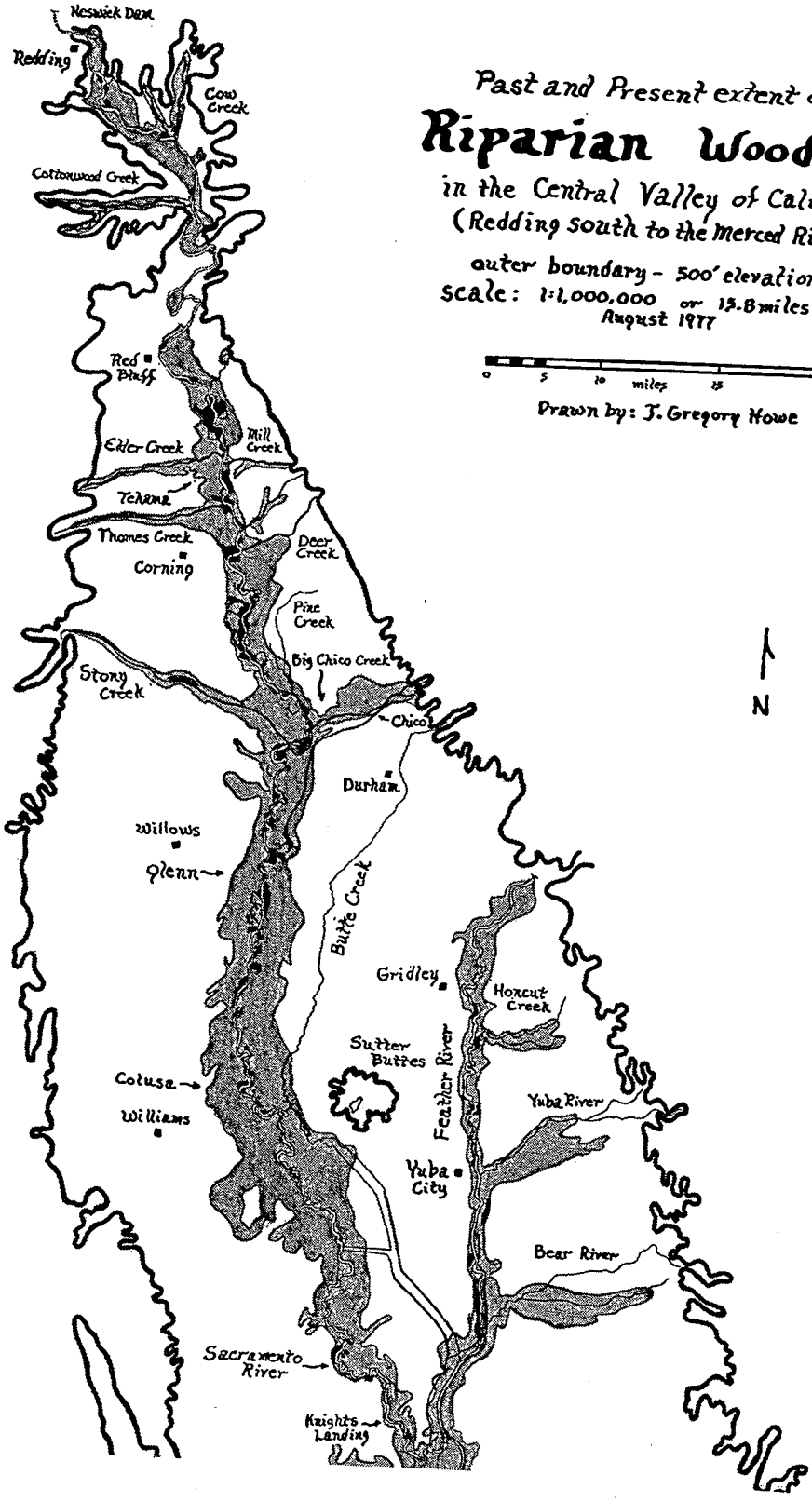


Figure 2.

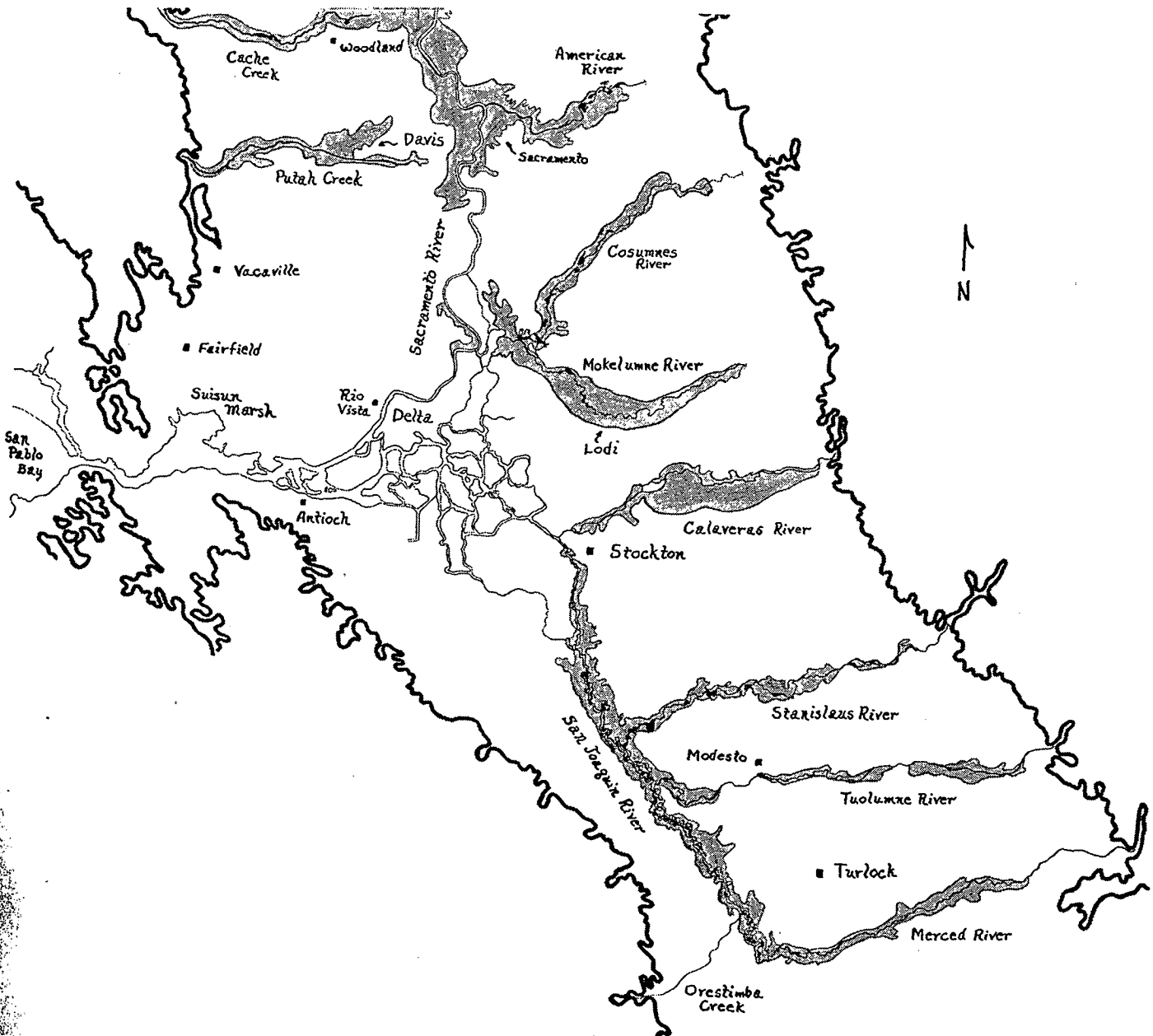


Table 1. Woody Plants of the Riparian Forests of California.

A. Central Valley Riparian Forest.

1. TREES

a. Common:

Acer negundo subsp. *californicum*. box elder.
Platanus racemosa. California sycamore.
Populus fremontii. cottonwood
Quercus lobata. valley oak, water oak.
Salix goodingii var. *variabilis*. willow.
Salix laevigata. red willow.
Salix lasiandra. black willow.

b. Uncommon:

Aesculus californica. California buckeye.
Ailanthus altissima. tree-of-heaven. (exotic)
Alnus rhombifolia. sierra alder.
Ficus carica. fig. (exotic)
Fraxinus latifolia. ash.
Juglans hindsii. native black walnut.
Morus alba. white mulberry. (Kern R.)
Pistacia chinensis. Chinese pistache. (Chico area) (exotic)
Quercus agrifolia. coast live oak. (Delta area)
Quercus wislizenii. interior live oak.
Robinia pseudo-acacia. black locust. (exotic)
Salix goodingii var. *goodingii*. willow. (s. from Yolo Co.)

2. SHRUBS

a. Common:

Artemisia douglasiana. mugwort.
Arundo donax. giant reed. (exotic)
Baccharis viminea. mule fat, false willow.
Cephalanthus occidentalis. button-willow.
Phoradendron tomentosum subsp. *macrophyllum*. big mistletoe. (parasite)
Phragmites communis var. *berlandieri*. common reed.
Rosa californica. wild rose.
Rubus discolor (syn. *R. procerus*). Himalayan blackberry. (exotic)
Rubus ursinus. wild blackberry.
Rubus vitifolius. wild blackberry.
Salix hindsiana. sandbar willow.
Salix lasiolepis. willow.
Salix melanopsis. willow.
Sambucus mexicana. elderberry.
Symphoricarpos rivularis. snowberry.
Tamarix parviflora. tamarisk, salt-cedar. (exotic)

b. Uncommon:

Atriplex lentiformis. quail-bush. (San Joaquin V.)
Baccharis douglasii. false-willow.
Baccharis glutinosa. false-willow. (s. San Joaquin V.)
Cornus glabrata. brown dogwood.
Cornus occidentalis. red osier dogwood.
Heteromeles arbutifolia. toyon.
Hibiscus californicus. wild hibiscus.
Lonicera involucrata. twin-berry honeysuckle. (delta)
Ptelea crenulata. hop tree. (n. Sacramento V.)
Rubus laciniatus. cut-leaf blackberry. (exotic)

Table 1, continued.

3. VINES

Aristolochia californica. Dutchman's pipe vine. (Sacramento V.)
Clematis lasiantha. wild clematis.
Clematis ligusticifolia. wild clematis.
Lonicera hispidula var. *vacillans.* wild honeysuckle. (uncommon)
Rhus diversiloba. poisonoak.
Smilax californica. greenbrier. (n. Sacramento V.)
Vitis californica. wild grape.

B. North Coast Riparian Forest.

1. TREES

a. Common:

Acer macrophyllum. big-leaf maple.
Alnus rubra. red alder.
Populus trichocarpa. black cottonwood.
Salix laevigata. willow.
Salix lasiandra. willow.
Sequoia sempervirens. redwood
Umbellularia californica. bay, pepperwood.

b. Uncommon:

Abies grandis. lowland fir.
Aesculus californica. California buckeye.
Alnus rhombifolia. white alder. (inland from the fog belt)
Picea sitchensis. Sitka spruce.
Thuja plicata. red cedar.
Tsuga heterophylla. western hemlock.

2. SHRUBS

a. Common:

Artemisia douglasiana. mugwort.
Artemisia suksdorfii. mugwort.
Baccharis douglasii. false willow.
Baccharis viminea. false willow.
Cornus occidentalis. red osier dogwood.
Physocarpus capitatus. ninebark.
Rhododendron occidentale. western azalea.
Rosa californica. wild rose.
Rubus discolor. Himalayan blackberry. (syn. *R. procerus*) (exotic)
Rubus ursinus. wild blackberry.
Rubus vitifolius. wild blackberry.
Salix coulteri. willow.
Salix hindsiana. sandbar willow.
Salix lasiolepis. willow.
Salix melanopsis. willow.
Salix scouleriana. willow.
Sambucus caerulea. elderberry.
Sambucus callicarpa. red elderberry.

b. Uncommon:

Acer circinatum. vine maple.
Calycanthus occidentalis. spicebush.
Cornus glabrata. brown dogwood.
Euonymus occidentalis. native euonymus.
Lonicera involucrata. twinberry honeysuckle.
Mahonia nervosum. dwarf Oregon-grape.
Malus fusca. wild crabapple.
Myrica californica. bayberry, California wax-myrtle.

Phragmites communis var. *berlandieri*. common reed.
Ribes bracteosum. stink currant. (n. from Mendocino Co.)
Ribes divaricatum. wild gooseberry.
Ribes laxiflorum. wild currant. (n. from Humboldt Co.)
Ribes menziesii. canyon gooseberry.
Ribes sericeum. wild gooseberry.
Rosa nutkana. wild rose. (n. from Mendocino Co.)
Rubus laciniatus. cut-leaf blackberry. (exotic)
Rubus parviflorus. thimble-berry.
Rubus spectabilis. salmon-berry.
Salix delnortensis. willow. (between 300' and 600' el., Smith R.)
Salix parksiana. willow. (n. from Humboldt Co.)
Salix sitchensis. willow.
Salix tracyi. willow. (n. from Humboldt Co.)
Vaccinium ovatum. huckleberry.

3. VINES

Aristolochia californica. Dutchman's pipe vine. (inland from fog belt)
Clematis ligusticifolia. wild clematis.
Lonicera hispidula var. *vacillans*. wild honeysuckle.
Rhus diversiloba. poisonoak.
Smilax californica. greenbrier. (uncommon)

C. Central Coast Riparian Forest. (north from the Santa Ynez Mountains through the San Francisco Bay area)

1. TREES

a. Common:

Platanus racemosa. sycamore.
Populus fremontii. cottonwood.
Populus trichocarpa. black cottonwood. (replaces *P. fremontii* on the Carmel R. and is dominant on the Santa Inez R.)
Salix laevigata. willow.
Salix lasiandra. willow.

b. Uncommon:

Acer macrophyllum. big-leaf maple.
Acer negundo subsp. *californicum*. box elder. (abundant locally)
Aesculus californica. California buckeye.
Alnus rhombifolia. white alder.
Alnus rubra. red alder.
Fraxinus latifolia. Oregon ash. (occasional: San Francisco Bay area)
Juglans hindsii. native black walnut. (native in e. S. F. Bay area counties)
Prunus cerasifera. cherry plum. (exotic, occasional in e. Marin Co. and s. Sonoma Co.)
Quercus agrifolia. live oak.
Quercus lobata. valley oak.
Sequoia sempervirens. redwood.
Umbellularia californica. baytree, California laurel.

2. SHRUBS

a. Common:

Artemisia douglasii. mugwort.
Arundo donax. giant reed. (exotic)
Baccharis douglasii. false willow.
Baccharis viminea. false willow, mule fat.
Cornus occidentalis. red osier dogwood.
Phoradendron tomentosum subsp. *macrophyllum*. big mistletoe. (parasite)
Phragmites communis var. *berlandieri*. common reed.
Rosa californica. wild rose.
Rubus ursinus. wild blackberry.

Table 1, continued.

Rubus vitifolius. wild blackberry.
Salix coulteri. willow.
Salix hindsiana. willow.
Salix lasiolepis. willow.
Salix lasiolepis var. *bigelovii.* willow.
Salix melanopsis. willow.
Salix scouleriana. willow.
Sambucus mexicana. elderberry.
Symphoricarpos rivularis. snowberry.

b. Uncommon:

Atriplex lentiformis subsp. *breweri.* quailbush.
Cornus glabrata. brown dogwood.
Euonymus occidentalis. native euonymus.
Forestiera neomexicana. desert olive.
Lonicera involucrata. twin berry honeysuckle.
Myrica californica. wax myrtle.
Physocarpus capitatus. nine bark.
Rhododendron occidentale. western azalea.
Ribes aureum var. *gracillimum.* golden currant.
Ribes divaricatum. wild gooseberry.
Ribes menziesii. canyon gooseberry.
Ribes sericeum. wild gooseberry.
Rubus discolor (syn. *R. procerus*). Himalayan blackberry. (exotic)
Rubus laciniatus. cut-leaf blackberry. (exotic)
Rubus parviflorus. thimbleberry.
Sambucus callicarpa. red elderberry.

3. VINES

Aristolochia californica. Dutchman's pipe vine. (uncommon).
Clematis lasiantha. wild clematis.
Clematis ligusticifolia. wild clematis.
Hedera helix. English ivy. (exotic—occasional escape)
Lonicera hispidula var. *vacillans.* wild honeysuckle.
Rhus diversiloba. poisonoak.

D. South Coast Riparian Forest. (south from the Santa Ynez Mountains)

1. TREES

a. Common:

Alnus rhombifolia. white alder.
Platanus racemosa. native sycamore, aliso. (dominant)
Populus fremontii. cottonwood, álamo.
Quercus agrifolia. coast live oak, encina.
Salix laevigata. willow, sauce.
Salix lasiandra. willow, sauce.

b. Uncommon

Acer macrophyllum. big-leaf maple.
Acer negundo subsp. *californicum.* box elder.
Ailanthus altissima. tree-of-heaven. (exotic)
Juglans californica. native black walnut, nogal.
Populus trichocarpa. black cottonwood, álamo.
Umbellularia californica. California laurel, bay tree, laurel.

2. SHRUBS

a. Common

Artemisia douglasiana. mugwort.
Arundo donax. giant reed, carrizo. (exotic)

Table 1, continued.

Baccharis emoryi. baccharis.
Baccharis glutinosa. water-wally, seep willow.
Baccharis pilularis subsp. *consanguineus.* coyote bush.
Baccharis sarothroides. broom baccharis.
Baccharis viminea. mule fat.
Cornus occidentalis. red osier dogwood.
Phoradendron tomentosum subsp. *macrophyllum.* big mistletoe. (parasite)
Phragmites communis var. *berlandieri.* common reed, carrizo.
Rosa californica. wild rose, rosa.
Rubus ursinus. wild blackberry.
Salix hindsiana. willow, sauce.
Salix lasiolepis. willow, sauce. (the most common willow in s. Calif.)
Sambucus mexicana. elderberry, saúco.

b. Uncommon:

Atriplex lentiformis subsp. *breweri.* quail bush. (n. from Orange Co.)
Baccharis douglasii. mule fat, false willow.
Berberis nevinii (syn. Mahonia n.). San Fernando barberry.
Cornus glabrata. brown dogwood.
Cornus stolonifera. red osier dogwood.
Forestiera neomexicana. desert olive.
Myrica californica. wax myrtle.
Ribes aureum var. *gracillimum.* golden currant.
Salix goodingii var. *variabilis.* willow, sauce.
Tamarix africana. tamarisk. (mouth of Ventura R.) (exotic)
Tamarix parviflora. tamarisk. (exotic)

3. VINES

Clematis ligusticifolia. wild clematis.
Lonicera hispidula var. *vacillans.* wild honeysuckle. (n. from W. Riverside Co., uncommon)
Rhus diversiloba. poisonoak.
Vitis girdiana. wild grape, uva cimarrona.

E. Palm Oases.

1. TREES

Cercidium floridum. palo verde.
Platanus racemosa. sycamore.
Populus fremontii. cottonwood.
Washingtonia filifera. California fan palm.

2. SHRUBS

Arundo donax. giant reed. (exotic)
Atriplex lentiformis. quail bush.
Baccharis glutinosa. water-wally, seep-willow.
Baccharis sarothroides. broom baccharis.
Chilopsis linearis. desert willow.
Nerium oleander. oleander. (uncommon) (exotic)
Phragmites communis var. *berlandieri.* common reed.
Pluchea sericea. arrowweed.
Prosopis glandulosa. mesquite.
Prosopis pubescens. screwpod.
Salix exigua. narrow-leaf willow.
Salix goodingii var. *goodingii.* willow.

3. VINES

Vitis girdiana. wild grape.

Table 1, continued.

F. Mojave River Riparian Forest.

1. TREES

Alnus rhombifolia. alder. (to Victorville)
Fraxinus velutina. ash. (to Victorville)
Platanus racemosa. sycamore. (to hesperia)
Populus fremontii. cottonwood. (to Alton)

2. SHRUBS

Atriplex lentiformis. quailbush.
Baccharis glutinosa. water-wally, seep-willow.
Phragmites communis var. *berlandieri.* reed.
Salix exigua. narrow-leaf willow.
Salix goodingii var. *goodingii.* willow. (to Alton)

3. VINES

? *Vitis girdiana.* wild grape.

G. Colorado River Riparian Forest, woody plant species.

1. TREES

? *Parkinsonia aculeata.* Jerusalem thorn. (exotic)
Populus fremontii var. *macdougallii.* cottonwood, álamo.
Tamarix aphylla. salt-cedar. (common only at Needles) (exotic)

2. SHRUBS

Arundo donax. giant reed. (exotic)
Baccharis glutinosa. water-wally.
Baccharis sarothroides. broom baccharis.
Phragmites communis var. *berlandieri.* common reed.
Pluchea sericea. arrowweed.
Salix exigua. narrow-leaf willow.
Salix goodingii var. *goodingii.* willow, sauce.
Sesbania macrocarpa. Colorado River hemp. (woody annual)
Tamarix chinensis. tamarisk. (exotic)
Tamarix ramosissima. tamarisk. (exotic)

3. MESQUITE ASSOCIATION. (restricted to a narrow belt along the outer edge of the riparian area and mostly above the high water mark. It has been largely destroyed for fuel)

Atriplex lentiformis. quailbush.
Cercidium floridum. palo verde.
Chilopsis linearis. desert willow.
Lycium spp. box thorn.
Prosopis glandulosa. mesquite.
Prosopis pubescens. screwpod, tornillo.
Suaeda torreyana. seep weed.

H. Owens Valley Riparian Forest. woody plant species. The Owens River is an active depositional stream for about 40 miles downstream from Crowley Lake, continually producing new channels. It is said to be bordered for much of its length with good riparian forest including some very large *Populus fremontii.*

1. TREES

Celtis reticulata. hackberry. (uncommon)
Pinus ponderosa. yellow pine. (uncommon)
Populus fremontii. cottonwood. (dominant)

Table 1, continued.

Populus trichocarpa. black cottonwood.
Salix laevigata. willow. (dominant)

2. SHRUBS

Baccharis glutinosa. water-wally
Betula occidentalis. western birch. (above 4000' el.) (uncommon)
Forestiera neomexicana. desert olive. (uncommon)
Phragmites communis var. *berlandieri.* reed.
Rosa woodsii. wild rose.
Salix exigua. narrow-leaf willow.
Salix lasiolepis var. *bracelinae.* willow.
Salix ligulifolia. willow.
Tamarix sp. tamarisk. (uncommon) (exotic)

I. Northeastern California Riparian Forests, woody plant species. (within the broad valleys in the Cascade and Siskiyou ranges and the Great Basin)

1. TREES

Alnus rhombifolia. alder.
Fraxinus latifolia. ash.
Populus trichocarpa. cottonwood.
Quercus garryana. Oregon oak. (Siskiyou Range)
Salix laevigata. willow.

2. SHRUBS

Cornus stolonifera. red osier dogwood.
Crataegus douglasii. western hawthorn.
Phragmites communis var. *berlandieri.* reed.
Rosa californica. wild rose.
Salix exigua. narrow-leaf willow.
Salix lasiolepis var. *bracelinae.* willow.
Salix lutea var. *watsonii.* willow.

References

Lowe, Charles H. (personal communication)
Taylor, Dean W. (personal communication)
see also Literature Cited

Table 2. Mammals of the Sacramento Valley Riparian Forests. (Ingles, 1965; Stone, 1976; S. Berry, R. Rudd and G. Trapp, personal communications).

Didelphis marsipialis - common opossum
Scapanus orarius - coast mole
Sorex ornatus - ornate shrew
Myotis yumanensis - Yuma myotis
Myotis californicus - California myotis
Eptesicus fuscus - big brown bat
Lasiurus borealis - red bat
Lasiurus cinereus - hoary bat
Plecotus townsendii - lump-nosed bat
Antrozous pallidus - pallid bat
Tadarida brasiliensis - Brazilian free-tailed bat
Lepus californicus - black-tailed hare
Sylvilagus audubonii - Audubon cottontail
Otospermophilus beecheyi - Beechey ground squirrel
Sciurus griseus - western gray squirrel
Thomonys bottae - Botta pocket gopher
Caster canadensis - beaver
Reithrodontomys megalotis - western harvest mouse
Microtus californicus - California meadow mouse
Ondatra zibethica - muskrat
Rattus norvegicus - Norway rat
Rattus rattus - black rat
Mus musculus - house mouse
Canis latrans - coyote
Vulpus fulva - red fox
Urocyon cinerargenteus - gray fox
Bassariscus astutus - ringtail
Procyon lotor - raccoon
Mustela frenata - long-tailed weasel
Mustela vison - mink
Taxidea taxus - badger
Spilogale putorius - spotted skunk
Mephitis mephitis - striped skunk
Lutra canadensis - river otter
Lynx rufus - bobcat
Sus scrofa - wild boar
Odocoileus hemionus - mule deer
Felis cattus - feral house cat
Erethizon dorsatum - porcupine

Table 3. Reptiles and Amphibians of the Sacramento Valley Riparian Forests. (Stebbins, 1966; and D. Jue, personal communication).

Ambystoma tigrinum - tigar salamander	rare
Scaphiopus hammondi - western spadefoot	rare
Bufo boreas - western toad	abundant
Hyla regilla - Pacific tree frog	abundant
Rana catesberana - bullfrog	abundant
Rana aurora - red legged frog	?
Clemmys marmorata - western pond turtle	frequent
Sceloporus occidentalis - western fence lizard	abundant
Uta stansburiana - side-blotched lizard	rare
Phrynosoma coronatum - coast horned lizard	rare
Eumecus skiltonianus - western skink	frequent
Eumecus gilbrti - Gilbert's skink	frequent
Cnemidophorus tigris - western whiptail	frequent
Gerrhonotus multicarinatus - southern alligator lizard	common-abundant
Coluber constrictor - racer	common-abundant
Pituophis melanoleucus - gopher snake	common-abundant
Lampropeltis getulus - common kingsnake	frequent
Thamnophis couchi ssp. *gigas* - giant garter snake	endangered-very rare
Crotalus vividis - western rattlensnake	frequent
Thamnophis sirtalis - common garter snake	common

Table 4. Butterflies of the Sacramento Valley Riparian Forests. Data from Shapiro (1974).

Butterfly			Host Plant
Phyciodes campestris Field Crescent	endemic native	uc	*Aster chilensis*
Polygonia satyrus Satyr Anglewing	native	uc	*Urtica holosericea*
Nymphalis antiops Mourning Cloak	native	fc-c	*Salix* sp.
Limenitis lorquini Lorquins Admiral	endemic native	c	*Salix* sp.
Atlides halesus Great Blue Hairstreak	native	c	*Phoradendron tomentosum* var. *macrophyllum*
Satyrium californica California Hairstreak	endemic native	uc	*Quercus lobata* may be endangered
Satyrium sylvinus Willow Hairstreak	native	c-a	*Salix hindsiana*
Everes comyntes Tailed Blue	endemic native	c	Many species, the most closely associated with riparian woodland being *Lathyrus jepsonii* ssp. *californicus*
Glaucopsyche lygdanus behrii Behr's Silvery Blue	native	c	
Battus philenor Pipevine Swallowtail	native	fc	*Aristolochia californica*
Papilio zelicson Anise Swallowtail	native?	c	*Foeniculum vulgare*
Papilio rutulus Western Tigar Swallowtail	native	c	*Fraxinus, Prunus, Populus* or *Platanus*
Papilio multicaudatus Two-tailed Swallowtail	native	fc	Unknown; likely to be the same as *Papilio rutulus*
Epargyraus clarus Silver Spotted Skipper	native	uc	*Robinia pseudoacacia*
Erynnis persius Persius Duskywing	native	fc	*Lotus purshianus*
Ochlodes sylvanoides Woodland Skipper	native	a	Gramineae
Poanes melane Umber Skipper	native	fc-c	(Gramineae)

Key: a = abundant
c = common
fc = frequent-common
uc = uncommon